

# Mir crew gearing up for visit by *Endeavour* astronauts

Mir 24 Commander Anatoly Solovyev, Flight Engineer Pavel Vinogradov and U.S. Astronaut David Wolf are gearing up for next week's scheduled launch of *Endeavour* on the eighth mission to link up a shuttle to the Mir Space Station following space walk activity over the past 10 days in the name of science and Mir systems.

Solovyev and Vinogradov ventured outside Mir late in the day Jan. 8 to survey the hatch to the outer airlock on the Kvant-2 module from which space walks are normally staged and to retrieve an experiment called the Optical Properties Monitor, which was deployed outside the Mir last April during a space walk by Astronaut Jerry Linenger.

The Kvant-2 airlock has failed to hold pressure since late last year, possibly because of a problem with the hatch seal. Since then, space walks have been conducted from an inner airlock in the Kvant-2 module, which serves as a backup. During the four and a half hour space walk, Solovyev and Vinogradov reported to Russian flight controllers that one of 10 primary latches that hold the airlock hatch firmly shut appeared to be broken. Secondary latches were used to seal the hatch at the conclusion of the space walk, but pressure dropped again in the airlock over the weekend. Russian engineers are continuing to evaluate additional options for further attempts at maintaining the proper pressure in the airlock.

Pending final joint approval by NASA and Russian officials, Wolf was scheduled to join Solovyev outside Mir on Wednesday for a two and a half hour space walk to conduct tests with a portable spectrometer designed to analyze the effect of the space environment on the exterior of the Mir. The data will be used to better characterize what may be needed for additional protection for the components of International Space Station against the harsh environment of low Earth orbit.

Wolf's space walk, if approved, would be the third by a U.S. astronaut in a Russian suit. Linenger conducted the first space walk by an American in a Russian extravehicular mobility suit last April, and Michael Foale joined Solovyev outside Mir last September to survey damage to the Spektr module.

The OPM will be returned to Earth aboard *Endeavour* at the conclusion of the STS-89 mission, which is scheduled for launch Jan. 22. Aboard *Endeavour* will be Astronaut Andy Thomas, beginning a four-month stint aboard Mir, replacing Wolf as the final U.S. astronaut to occupy the Russian outpost. Thomas will return to Earth on STS-91 in June.



## Spacehab gets JSC contract

Work to focus on research, logistics support activities

JSC has awarded a \$42.86 million, two and one-half year contract to Spacehab Inc., Vienna, Va., for research and mission logistics support.

Spacehab will perform the work in the NASA Payload Processing Facility at Cape Canaveral, Fla. The total awarded price of the contract, inclusive of all options, is \$60.72 million and is anticipated to extend for approximately three years.

The basic contract is for the lease of the Spacehab modules, and for integration and operations services supporting the Space Shuttle Program for three missions.

The contract also covers four options involving varying module types to be leased for an additional mission. It is a follow-on contract to the Spacehab Phase 1 contract, which involves services in support of the shuttle-Mir program.

The new contract will provide logistical support to the International Space Station, and both NASA and commercial science experiments.



NASA's Lunar Prospector spacecraft launches on its way to the Moon from Launch Complex 46 at Cape Canaveral Air Station at 8:28 p.m. CST Jan. 6. It was the inaugural launch of Lockheed Martin's Athena II launch vehicle and the first launch from LC46, operated by Spaceport Florida Authority. Lunar Prospector, built for Ames Research Center by Lockheed Martin, is a spin-stabilized spacecraft designed to provide NASA with the first global maps of the Moon's surface and its gravitational magnetic fields, as well as look for the possible presence of ice near the lunar poles.

## Lunar Prospector performing well

The Mission Control Center at NASA's Ames Research Center reported early this week that the Lunar Prospector spacecraft had successfully completed two-thirds of the maneuvers required to put it into its final desired mapping orbit 62 miles above the lunar surface.

That was achieved with Monday morning's second lunar orbit insertion burn, which placed it in an orbital plane that is almost perpendicular to the Earth-Moon line, so that the spacecraft never gets behind the Moon as seen from Earth and continuous communications can be maintained. The third and final LOI burn was scheduled for Tuesday morning.

The spacecraft continues to perform precisely as planned. The spacecraft's science booms have been completely deployed and all science instruments have been turned on. Data is flowing from the omni antenna, and the spacecraft is spinning at 12.15 rpm.

NASA's Discovery program of low-cost, science-focused space exploration missions got off to a smooth start Jan. 6 with the successful launch of Lunar Prospector.

The Lockheed Martin Athena II launch vehicle roared off Spaceport Florida's pad 46 at the new, commercial launch complex at Cape Canaveral, Fla., on schedule at 8:28 p.m. JSC time less than one second into the opening of the window.

The launch vehicle's three stages worked as planned, rocketing the spacecraft to an altitude of 62,500 feet after 88 seconds at Stage 1 burnout. All milestones were achieved on schedule during the remainder of the ascent phase, culminating in attainment of a successful "parking orbit" around the Earth at an altitude of 125 statute miles.

After completing almost three-quarters of a revolution around the Earth, the vehicle's Trans Lunar Injection stage completed a successful 64 second burn, blasting the spacecraft out of Earth orbit and setting the spin-stabilized vehicle on its 105-hour "coast" to the Moon.

Payload separation from the third stage of the launch vehicle was successful, and spacecraft activation was accomplished 56 minutes after launch.

Lunar Prospector is designed to provide a precise global map of the Moon's surface element composition and its gravity and magnetic fields.

Lunar Prospector will conduct a one-year primary mission, mapping the surface composition and internal structure, volatile activity, and magnetic and gravity fields of the Moon from an altitude of approximately 63 miles. Lunar is expected to provide definitive evidence of the presence or absence of water ice in shaded lunar polar regions.

The Prospector web site may be found at: <http://lunar.arc.nasa.gov>.

# One of Milky Way's biggest stars may be a double

One of the Milky Way Galaxy's largest stars may in fact be a double star system, according to recent research by a team of astronomers using NASA's Rossi X-ray Timing Explorer spacecraft.

The team's results were the subject of a Jan. 7 presentation in Washington, D.C., at the winter meeting of the American Astronomical Society.

The team, led by Dr. Michael Corcoran of the Universities Space Research Assoc., bases its conclusions on unusual variations in the intensity of X-rays emitted by hot gas near the star, called Eta Carinae, which is about 7,500 light years from Earth. They believe that the variations are caused by the presence of a massive companion star in orbit around Eta Carinae.

The new work offers insight into the origin and evolution of a class of stars called luminous blue variables, which are the most massive stars known.

"Stars such as these shine so intensely that, sometimes, they become unstable and blow their outer layers off," said Corcoran. "That's what happened to Eta Carinae. During the mid-1800s, it blasted an amount of material equivalent to the mass of our entire solar system into space. The gas and dust that make up this material formed a shell that surrounds the star and now blocks it from direct view. We have taken what amounts to an X-ray of this shell and found that what's inside may really be two stars."

While using the Rossi Explorer to monitor the X-ray emission from Eta Carinae every week for a period of two years, the team found that X-rays emitted by hot gas near the star initially increased over a period of months and then rapidly diminished in intensity in a matter of days.

Such variability is highly unusual and has never before been observed for Eta Carinae. The simplest explanation is that the variability of the X-ray emission is due to the presence of a massive stellar companion orbiting the star, bound to each other by the force of gravity.

The presence of such a companion has recently been claimed based on variations in near-infrared and optical spectra by Dr. Augusto Damineli and collaborators at the University of Colorado at Boulder. However, the presence of the "companion" star remained controversial, since the spectrum of Eta Carinae is notoriously variable. As a result, the "binary model" for Eta Carinae has not yet been generally accepted by astronomers. The X-ray variations may help change this situation.

"We believe the orbit of the companion star is elongated into an ellipse," Corcoran said, "which alternately moves it closer to and further away from Eta Carinae over the five-and-a-half year orbital period."

## Scientists say 'Old Faithful' black hole regularly ejects mass equal to asteroid

Scientists observing a disk of matter surrounding a black hole in our galaxy have discovered that the disk is periodically disrupted and hurled outward in opposite directions from the black hole, in jets moving at nearly the speed of light. The black hole replenishes the disk by pulling hot gas from the surface of a nearby "companion" star, and then undergoes another disruption, repeating the sequence at half-hour intervals.

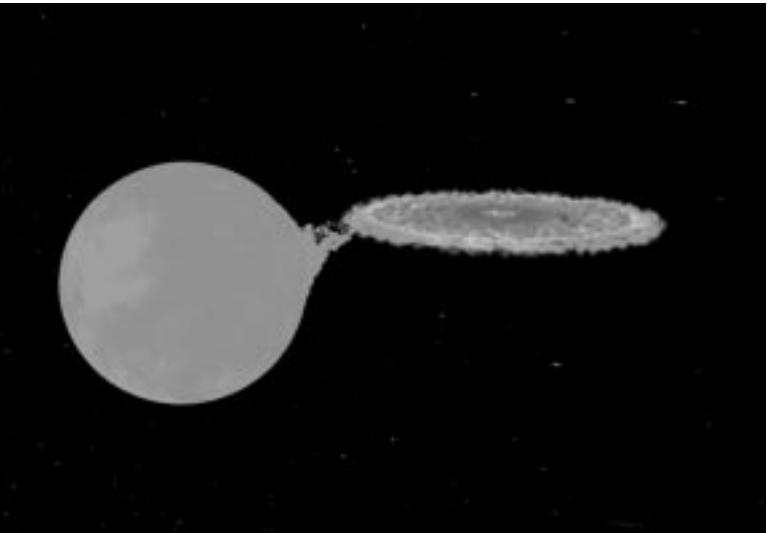
The researchers represent teams at the California Institute of Technology, the Massachusetts Institute of Technology, and Goddard Space Flight Center, which all worked to correlate the disappearance of X-ray emitting hot gas with the appearance, shortly thereafter, of rapidly expanding jets.

Dr. Ronald Remillard of MIT and Dr. Jean Swank of Goddard presented X-ray results, obtained with NASA's Rossi X-ray Timing Explorer which show the disappearing disk. Dr. Stephen Eikenberry of Caltech discussed new infrared observations, which demonstrate that when the X-rays from the disk vanish, the jets suddenly appear. The observations were presented Jan. 7 during the winter meeting of the American Astronomical Society.

The disks of hot gas, known as accretion disks, are commonly observed around black holes with orbiting stellar companions, but the near simultaneous disappearance of the disk and formation of the jet has never been seen before. It promises to shed light on the origin of the enigmatic jets, also commonly observed near accreting black holes, but poorly understood.

"The system behaves like the celestial version of Old Faithful," noted Dr. Craig Markwardt, a researcher working with Swank at

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NASA Photo  
A black hole being studied with NASA's Rossi X-ray Timing Explorer collects hot gas from a nearby companion star.